JXM-MUX
Video Splitter

User Manual

Jetter

Item # 60874930

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Assignment to Product   This user manual is an integral part of JXM-MUX:

                           Type:
                           _____

                           Serial #:
                           _____

                           Year of construction:
                           _____

                           Order #:
                           _____

                           To be entered by the customer:

                           Inventory #:

                           Place of operation:
                           _____

Significance

Significance of this user manual

The user manual is an integral part of JXM-MUX:

- It must be kept in a way that it is always at hand, until the JXM-MUX will be disposed of.
- If the JXM-MUX is sold or loaned/leased out, the user manual has to be passed on.

In any case you encounter difficulties to clearly understand this user manual, please contact the manufacturer.

We would appreciate any suggestions and contributions on your part and would ask you to contact us by our e-mail address info@jetter.de. This will help us to produce manuals that are more user-friendly and to address your wishes and requirements.

This user manual contains important information on how to transport, erect, install, operate, maintain and repair the JXM-MUX.

Therefore, the persons carrying out these jobs must carefully read, understand and observe this user manual, and especially the safety instructions.

Missing or inadequate knowledge of the user manual results in the loss of any claim of liability on part of Jetter AG. Therefore, the operating company is recommended to have the instruction of the persons concerned confirmed in writing.

Table of Contents

1   Safety Instructions

Introduction   This chapter informs the user of general safety instructions and warns of residual dangers, if applicable. Furthermore, it contains information on EMC.

Contents

Basic Safety Instructions

Introduction

This device complies with the valid safety regulations and standards. Special emphasis was given to the safety of the users.

Of course, the user should adhere to the following regulations:

- relevant accident prevention regulations;
- accepted safety rules;
- EC guidelines and other country-specific regulations

Intended Conditions of Use

Usage according to the intended conditions of use implies operation in accordance with this user manual.

This device has been designed as a peripheral module for use in commercial vehicles and mobile machines and is intended for connection to an already existing controller. The JXM-MUX is a video splitter merging up to 4 video signals into one video signal.

The JXM-MUX meets the requirement of the European Automotive EMC Directive for electric/electronic subassemblies.

The JXM-MUX must be operated within the limits given in the technical specifications. The operating voltage of the JXM-MUX is classified as SELV (Safety Extra Low Voltage). Therefore, the JXM-MUX is not subject to the EU Low Voltage Directive.

Usage Other Than Intended

This device must not be used in technical systems which to a high degree have to be fail-safe, e.g. ropeways and aeroplanes.

The JXM-MUX is no safety-related part as per Machinery Directive 2006/42/EC. This device is not qualified for safety-relevant applications and must, therefore, NOT be used to protect persons.

If the device is to be run under ambient conditions which differ from the allowed operating conditions, Jetter AG is to be contacted beforehand.

Personnel Qualification

Depending on the life cycle of the product, the persons involved must possess different qualifications. These qualifications are required to ensure proper handling of the device in the corresponding life cycle.

Product Life Cycle	Minimum Qualification
Transport / Storage:	Trained and instructed personnel with knowledge in handling electrostatic sensitive components.
Mounting / Installation:	Specialized personnel with training in electrical/automotive engineering, such as automotive mechatronics fitters.
Commissioning / Programming:	Trained and instructed experts with profound knowledge of, and experience with, automotive / automation technology, such as automotive engineers for mobile machinery.
Operation:	Trained, instructed and assigned personnel with knowledge in operating electronic devices for mobile machinery.

Product Life Cycle	Minimum Qualification
Decommissioning:	Specialized personnel with training in electrical/automotive engineering, such as automotive mechatronics fitters.

Modifications and Alterations to the Device

For safety reasons, no modifications and changes to the device and its functions are permitted.

Any modifications to the device not expressly authorized by Jetter AG will result in a loss of any liability claims to Jetter AG.

The original parts are specifically designed for the device. Parts and equipment from other manufacturers are not tested on our part, and are, therefore, not released by Jetter AG.

The installation of such parts may impair the safety and the proper functioning of the device.

Any liability on the part of Jetter AG for any damages resulting from the use of non-original parts and equipment is excluded.

Transport

The JXM-MUX contains electrostatic sensitive components which can be damaged if not handled properly.

To exclude damages to the JXM-MUX during transport it should only be shipped in its original packaging or in packaging protecting against electrostatic discharge. This is particularly true for transport via mail.

- Use an appropriate outer packaging to protect the JXM-MUX against impact or shock.
- In case of damaged packaging inspect the device for any visible damage. Inform your freight forwarder and the manufacturer, if applicable.

Storing

When storing the JXM-MUX observe the environmental conditions given in the technical specification.

Repair and Maintenance

This device must not be repaired by the operators themselves. The device does not contain any parts that could be repaired by the operator.
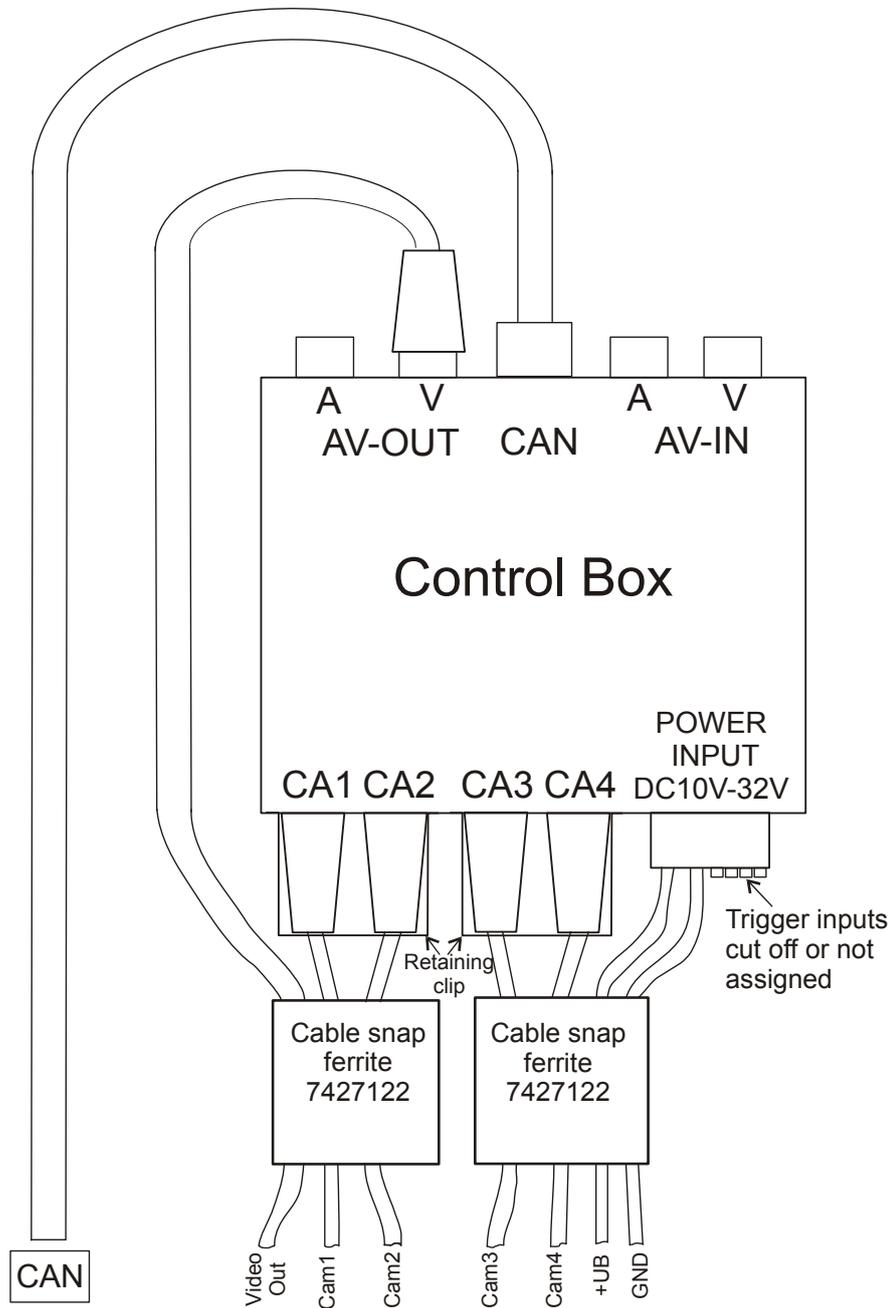
The device must be sent to Jetter AG for repair.

Disposal

When disposing of devices, the local environmental regulations must be complied with.

Instructions on EMI

Wiring Instructions

To ensure immunity to interference the JXM-MUX must be wired as shown below. The jacks CA1 to CA4 are soldered to the JXM-MUX housing.

2   Installation

Introduction	This chapter covers the configuration, interfaces and installation of the video splitter JXM-MUX.
Wiring Instructions	To ensure immunity to interference follow the **wiring instructions** on page 10.

Contents

2.1 Equipment Configuration

Introduction   This chapter describes equipment configuration.

Contents

JXM-MUX - Product Description

Video Splitter JXM-MUX
The JXM-MUX is a video splitter merging up to 4 video signals. Up to 4 cameras can be connected to it. The signals from these cameras are routed to the monitor. Optionally one to four video signals can be displayed on the monitor. Supported video standards are PAL or NTSC. Each video signal from the cameras can be mirrored, for example when a camera is used as rear view camera.

The video splitter is controlled by a CAN interface with implemented CANopen® protocol.

Product Image

Product Features
The features of this module are listed below:

- Video system: NTSC, PAL (5 channels)
- 4 camera jacks (5-pin MiniDIN connectors)
- 1 video input (RCA/cinch)
- 1 audio input (RCA/cinch) (not supported)
- 1 video output (RCA/cinch)
- 1 audio output (RCA/cinch) (not supported)
- Controlled by a CAN interface with implemented CANopen® protocol.

Scope of Delivery
The following items are included in the scope of delivery of the video splitter JXM-MUX:

| Item #	Quantity	Description
10000790	1	Video splitter JXM-MUX with power cable (2 m) and 2 retaining clips
60240700	2	Cable snap ferrite
60873457	1	CAN cable 1 m
60873458	1	CAN terminating resistor (120 Ω) for connection to JXM-MUX

Interfaces of Video Splitter JXM-MUX

Interfaces   The video splitter JXM-MUX is equipped with the following interfaces:
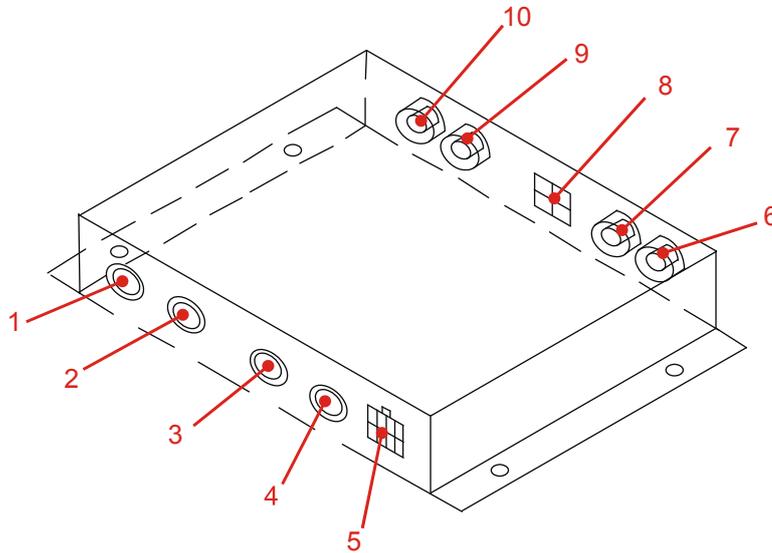
Number	Element	Function
1	CA1	Camera input # 1
2	CA2	Camera input # 2
3	CA3	Camera input # 3
4	CA4	Camera input # 4
5	POWER	Power supply
6	V (AV-IN)	Video input
7	A (AV-IN)	Audio input (not supported)
8	MONITOR	CAN interface
9	V (AV-OUT)	Video output
10	A (AV-OUT)	Audio output (not supported)

JXM-MUX - Physical Dimensions
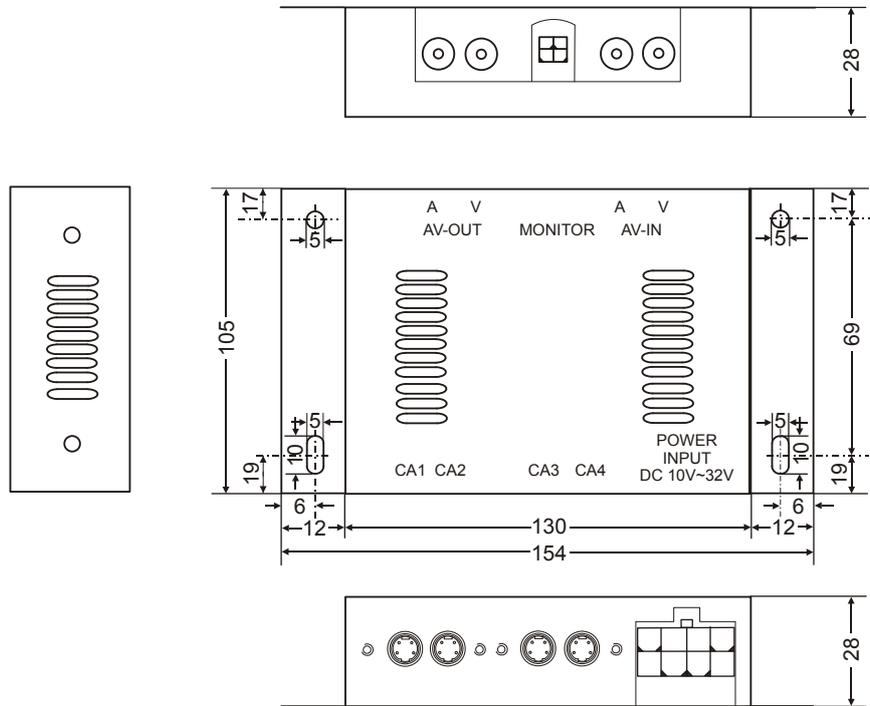
Physical Dimensions

Mounting Position   The video splitter JXM-MUX can be installed in vertical or horizontal position.

2.2 Interfaces

Jack POWER

The function of the jack POWER is as follows:

- Power supply for video splitter JXM-MUX

MiniDIN connectors (female) CA1 to CA4

The function of MiniDIN connectors CA1 to CA4 is as follows:

- Connection of cameras with an operating voltage of 12 VDC

RCA/cinch jacks V (AV-IN)

The function of the RCA/cinch jacks V (AV-IN) is as follows:

- Additional AUX input for a video signal

RCA/cinch jacks V (AV-OUT)

The function of the RCA/cinch jacks V (AV-OUT) is as follows:

- Output of a resulting video signal

CAN Interface

The function of the CAN interface is as follows:

- Configuration and control of the video splitter JXM-MUX via CANopen® bus
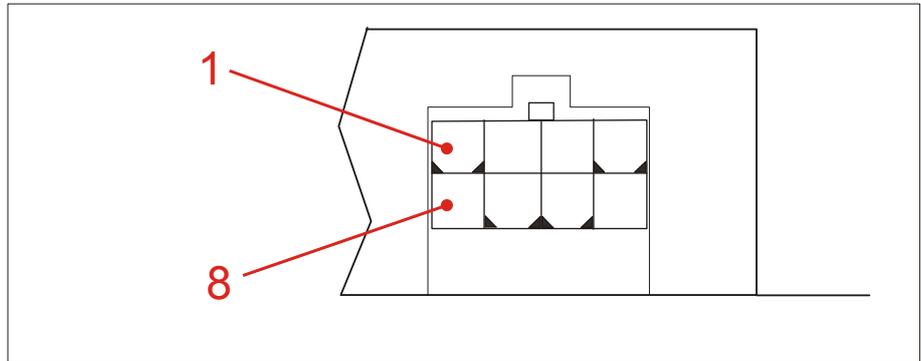
Contents

Power Supply Jack POWER

Purpose   The jack POWER is for connecting the power supply cord to the video splitter
                               JXM-MUX.

Contact Assignment

Pin	Function
1	VIn (10 ... 32 VDC)
8	Reference potential (GND)

Technical Data

Parameter	Value
Operating voltage	10 ... 32 VDC
Typical input current at 12 VDC	max. 2.0 A
Typical input current at 24 VDC	max. 1.0 A
Power consumption	24 W max.

Male Connector for   An 8-pole connector (male) is included in the scope of delivery of the video
POWER jack   splitter JXM-MUX. The power supply cord with one red and one black core
                               (each 2 m in length) is connected to the connector terminals.
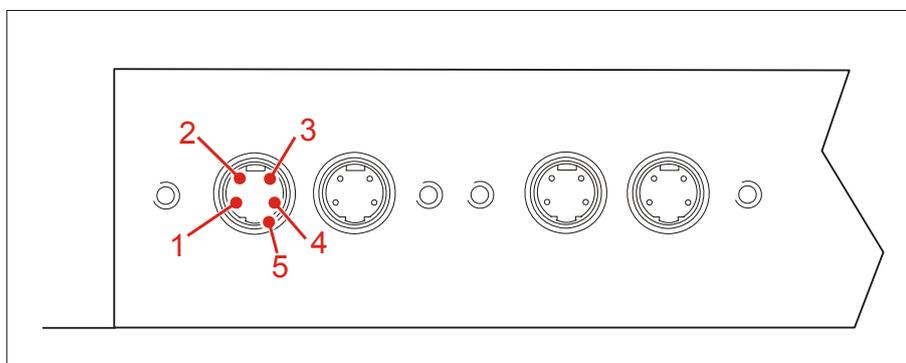
Camera Inputs CA1 to CA4

Purpose

The following camera types can be connected to the MiniDIN connectors CA1 to CA4:

- CCD cameras
- Internal vehicle cameras
- Rear view cameras
- Monitoring cameras
- Cameras with an operating voltage of 12 VDC
- Cameras with audio output
- Cameras with PAL or NTSC video signals

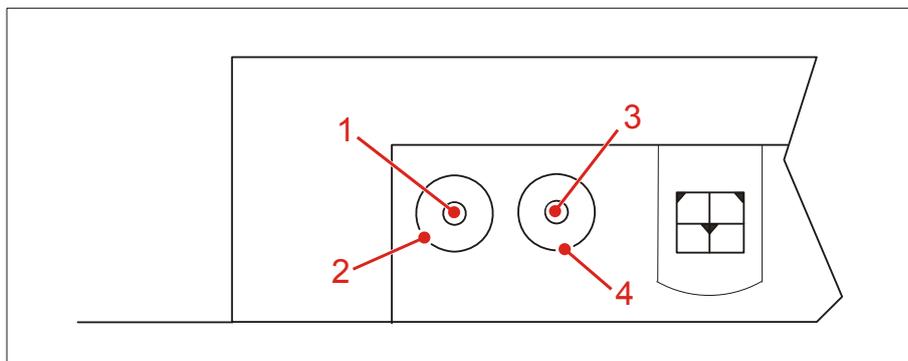**Contact Assignment of MiniDIN Connectors CA1 to CA4**

Pin	Function
1	Power 12 VDC
2	Audio IN
3	Mirror
4	Video IN
5	GND

A and V (AV-IN) Connections

**Purpose of A and V
(AV-IN) Connections**

The video splitter JXM-MUX offers the option to feed in an additional
video signal via AUX input (RCA/cinch jacks).

Audio signals are not supported.

**Contact Assignment of
A and V (AV-IN) Jacks**

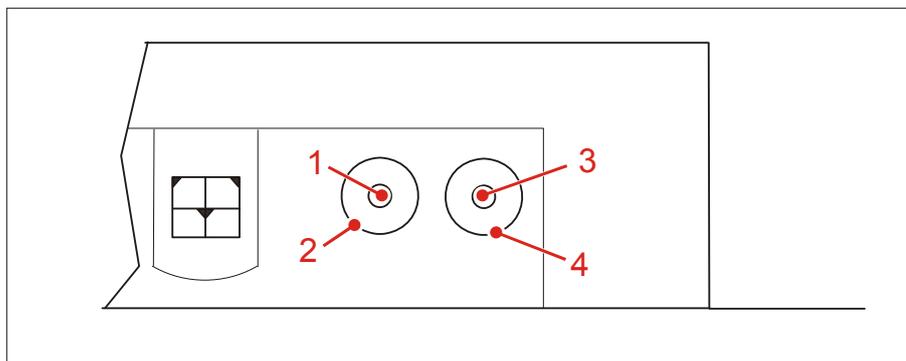| Pin	Function
1	Video input signal V (AV-IN)
2	Reference potential for video signal
3	Audio input signal A (AV-IN) (not supported)
4	Reference potential for audio signal (not supported).

A and V (AV-OUT) Connections

Purpose of A and V (AV-OUT) Connections

The video splitter JXM-MUX forms a resulting video signal from the incoming video signals. The resulting video signal is output via V (AV-OUT) jacks.

Audio signals are not supported.

Contact Assignment of A and V (AV-OUT) Jacks
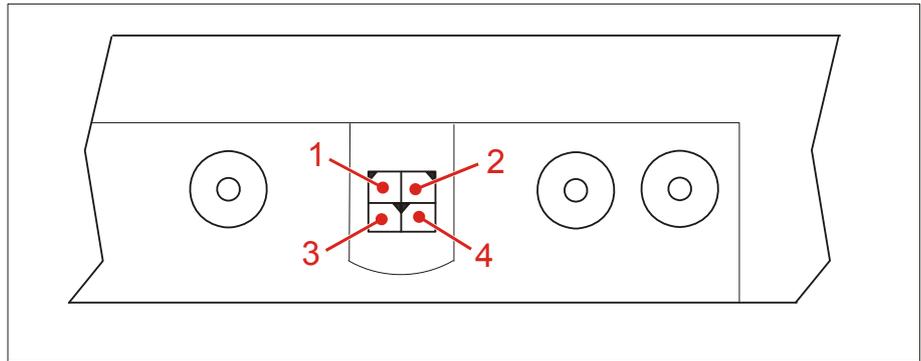

Pin	Function
1	Video output signal V (AV-OUT)
2	Reference potential for video signal
3	Audio output signal A (AV-OUT) (not supported)
4	Reference potential for audio signal (not supported).

CAN Interface

Purpose   The CAN interface is for connecting the video splitter JXM-MUX as
                            CANopen® node to a CANopen® bus. To this end, the CAN cable equipped
                            with the corresponding connector (item # 60873457) is plugged into the jack
                            MONITOR.

Contact Assignment

Pin	Function
1	CAN_H
2	CAN_L
3 - 4	Jumper = CAN terminating resistor (120 Ω)

Male Connector for   A 2-core power supply cord (1 m in length) (item # 60873457) equipped with a
MONITOR Jack   4-pin connector (male) fitting into the CAN interface is included in the scope of
                            delivery of the video splitter JXM-MUX.

2.3 Installation

Introduction

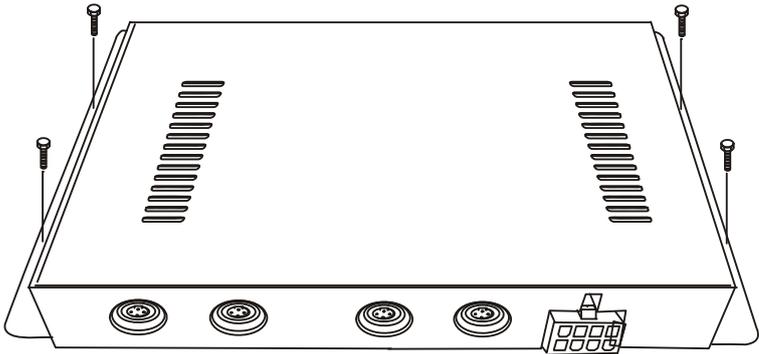This chapter describes how the video splitter JXM-MUX is to be installed.

Contents

JXM-MUX - Installation

Installation   Carry out the following steps for installing the video splitter JXM-MUX:

Step	Action
1	Install the video splitter JXM-MUX in a location which has a load carrying capacity of at least 5 kg.
2	Screw down the video splitter JXM-MUX as shown in the illustration below. When doing so, use the screws that come with the module.
3	Plug in the camera cables, **then** install the retaining clips using the screws that come with the module.
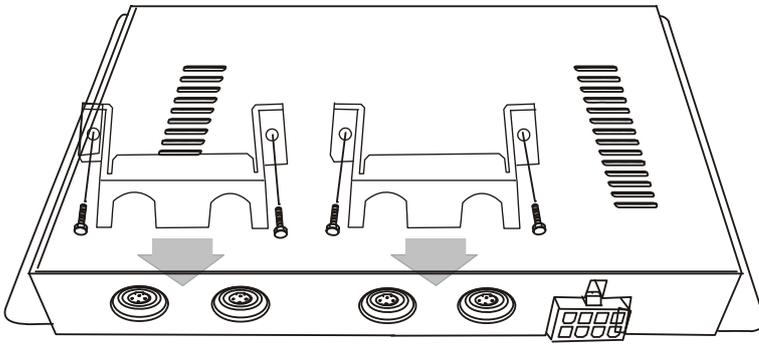
3   Configuration

Introduction   This chapter describes how the video splitter JXM-MUX is configured via
                          CANopen® interface.

Contents

JXM-MUX - Configuration

CANopen® Connectivity   The JXM-MUX features a CANopen® node with a rate of 250 kBaud. Its design complies with profile DS 301.

To allow function monitoring, the node acts as heartbeat producer sending a heartbeat object every 500 ms.

Configuring the NODE ID   The NODE ID is stored to the flash memory and is, thus, safeguarded against power loss. To set the NODE ID enter the required value into index 4000, sub-index 4. To store the newly set NODE ID to index 1010, sub-index 1 use command "Save All" (0x65766173).

Any changes become effective only after the module has been re-initialized.

Object Directory   All available objects are listed in the following illustration. For a detailed
                            definition refer to the EDS file.
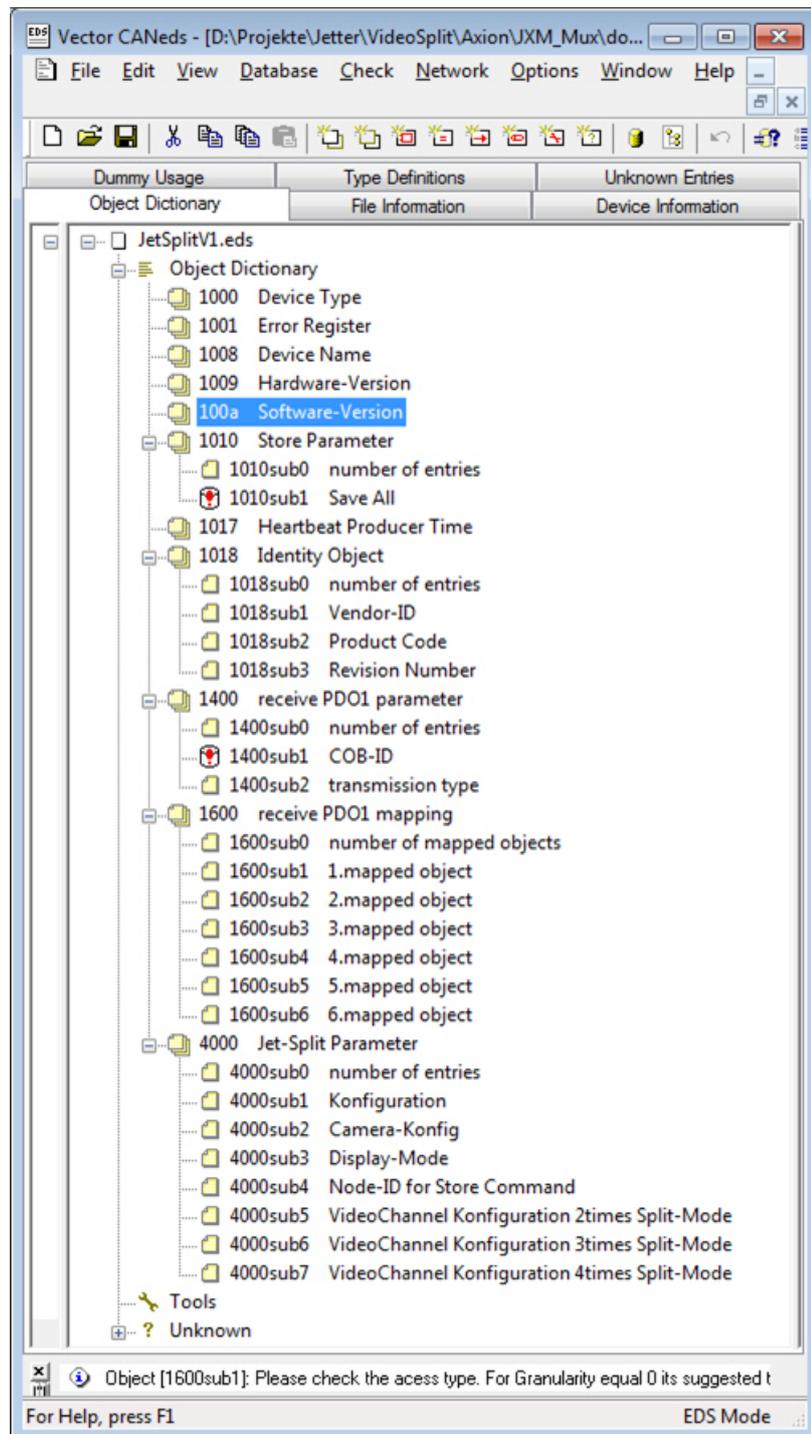
PDO Assignment and Parameters

PDO is short for Process Data Object. There is a permanently mapped PDO1_TX (0x200 + Node ID) with the following parameters:

Byte 0   Configuration: Operating parameters (index 4000, sub-index 1)

     Bit 0 ... 5   Reserved

     Bit 6   Video output 1 = NTSC, 0 = PAL

     Bit 7   JXM-MUX operating mode 1 = ON, 0 = OFF

Byte 1   Configuration: Camera (index 4000, sub-index 2)

     Bit 0   CAM1 Mirror

     Bit 1   CAM2 Mirror

     Bit 2   CAM3 Mirror

     Bit 3   CAM4 Mirror

     Bit 4 ... 7   Reserved

Byte 2   Configuration: Display mode (index 4000, sub-index 3)

     0   CAM1

     1   CAM2

     2   CAM3

     3   CAM4

     4   AUX

     5   2-channel split CAM1/CAM2

     6   3-channel split CAM1/CAM2/CAM3

     7   4-channel split CAM1/CAM2/CAM3/CAM4

Byte 3   Video channel - Display assignment for 2-channel split screen mode (index 4000, sub-index 5)

     (only valid if not 0, and not 0xFF)

     Bit 0, 1   Channel (0 ... 3) for left split screen half (default channel 0)

     Bit 2, 3   Channel (0 ... 3) for right split screen half (default channel 1)

Byte 4   Video channel - Display assignment for 3-channel split screen mode (index 4000, sub-index 6)

     (only valid if not 0, and not 0xFF)

     Bit 0, 1   Channel for top left split screen third (default channel 0)

     Bit 2, 3   Channel for top right split screen third (default channel 1)

     Bit 4, 5   Channel for bottom split screen third (default channel 2)

Byte 5   Video channel - Display assignment for 4-channel split screen mode (index 4000, sub-index 7)

     (only valid if not 0, and not 0xFF)

     Bit 0, 1   Channel for top left split screen quarter (default channel 0)

     Bit 2, 3   Channel for top right split screen quarter (default channel 1)

     Bit 4, 5   Channel for bottom left split screen quarter (default channel 2)

	Bit 6, 7 Channel for bottom right split screen quarter

Bit 6, 7   Channel for bottom right split screen quarter
(default channel 3)

Important Note   When assigning channels take into account that one channel cannot be split
into several split screens.

JetSym STX Program   The following program is for connecting camera 1 to video output of the
Activating camera 1   JXM-MUX module.

```
#Include "CanOpen.stxp"

Const
    // CAN number 0
    CAN_CONTROLLER_0 = 0;
    // Node ID of JVM-407
    NodeID_JVM_407 = 0x0A;
    // Node ID of JXM-MUX
    NodeID_JXM_MUX = 0x7F;
    // Event time in ms
    Event_Time = 1000;
    // Inhibit time in ms
    Inhibit_Time = 100;
End_Const;


Var
// Permanent PDO mapping of CAN data to JXM-MUX
    PDO1tx: Array [6] of Byte;
End_Var;



Task JXM_MUX_Control_Example_1 Autorun


Var
    SW_Version: String;
End_Var;


SW_Version := 'v4.3.0.2004';


// Initializing CAN 0 by JVM-407
CanOpenInit (CAN_CONTROLLER_0, NodeID_JVM_407, SW_Version);


// Transferring data via PDO to JXM-MUX


// Permanently assigning video output to camera 1
// Activating JXM-MUX
PDO1tx[0] := 0x80;
// No mirroring
PDO1tx[1] := 0;
// Assigning the video output to camera 1
PDO1tx[2] := 0;
```

```
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 0, CANOPEN_BYTE, 1, PDO1tx[0], Event_Time,
Inhibit_Time, CANOPEN_ASYNCPDO | CANOPEN_NORTR);
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 1, CANOPEN_BYTE, 1, PDO1tx[1], Event_Time,
Inhibit_Time, CANOPEN_ASYNCPDO | CANOPEN_NORTR);
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 2, CANOPEN_BYTE, 1, PDO1tx[2], Event_Time,
Inhibit_Time, CANOPEN_ASYNCPDO | CANOPEN_NORTR);


// All nodes on the CAN bus are in state PREOPERATIONAL
// Setting all nodes on the CAN bus to state OPERATIONAL
CanOpenSetCommand (CAN_CONTROLLER_0, CAN_CMD_NMT_Value
(CAN_CMD_NMT_ALLNODES, CAN_CMD_NMT), CAN_NMT_START);


//   ...
//   ...
//   ...

End_Task;
```

JetSym STX Program Selecting a 4-channel split screen

The following program is for selecting 4-channel split screen mode of the JXM-MUX module. The image of camera 4 is displayed in the top left quarter of the monitor. The image of camera 3 is displayed in the top right quarter of the monitor. The image of camera 2 is displayed in the bottom left quarter of the monitor. The image of camera 1 is displayed in the bottom right quarter of the monitor.

```
#Include "CanOpen.stxp"

Const
    // CAN number 0
    CAN_CONTROLLER_0 = 0;
    // Node ID of JVM-407
    NodeID_JVM_407 = 0x0A;
    // Node ID of JXM-MUX
    NodeID_JXM_MUX = 0x7F;
    // Event time in ms
    Event_Time = 1000;
    // Inhibit time in ms
    Inhibit_Time = 100;
End_Const;


Var
// Permanent PDO mapping of CAN data to JXM-MUX
    PDO1tx: Array [6] of Byte;
End_Var;


Task JXM_MUX_Control_Example_2 Autorun
```

```
Var
    SW_Version: String;
End_Var;


SW_Version := 'v4.3.0.2004';


// Initializing CAN 0 by JVM-407
CanOpenInit (CAN_CONTROLLER_0, NodeID_JVM_407, SW_Version);


// Setting display mode to 4-channel split
// Assigning channels: top left channel 3; top right channel 2
// Assigning channels: bottom left channel 1; bottom right
channel 0
// Activating JXM-MUX
PDO1tx[0] := 0x80;
// No mirroring
PDO1tx[1] := 0;
// Setting video output to 4-channel split: CAM1/CAM2/CAM3/CAM4
PDO1tx[2] := 7;
// Video channel assignment in 2-channel split screen mode
(default)
PDO1tx[3] := 0x04;
// Video channel assignment in 3-channel split screen mode
PDO1tx[4] := 0x24;
// Video channel assignment in 4-channel split screen mode
PDO1tx[5] := 0x1B;


CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 0, CANOPEN_BYTE, 1, PDO1tx[0], Event_Time,
Inhibit_Time, CANOPEN_ASYNCPDO | CANOPEN_NORTR);
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 1, CANOPEN_BYTE, 1, PDO1tx[1], Event_Time,
Inhibit_Time, CANOPEN_ASYNCPDO | CANOPEN_NORTR);
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 2, CANOPEN_BYTE, 1, PDO1tx[2], Event_Time,
Inhibit_Time, CANOPEN_ASYNCPDO | CANOPEN_NORTR);
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 5, CANOPEN_BYTE, 1, PDO1tx[5], Event_Time,
Inhibit_Time, CANOPEN_ASYNCPDO | CANOPEN_NORTR);


// All nodes on the CAN bus are in state PREOPERATIONAL
// Setting all nodes on the CAN bus to state OPERATIONAL
CanOpenSetCommand (CAN_CONTROLLER_0, CAN_CMD_NMT_Value
(CAN_CMD_NMT_ALLNODES, CAN_CMD_NMT), CAN_NMT_START);


//    ...
//    ...
//    ...

End_Task;
```

Appendix

Introduction   This appendix contains electrical and mechanical data, as well as operating data.

Contents

A: Technical Data

Introduction   This section of the appendix contains both electrical and mechanical data, as well as operating data of the JXM-MUX module.

Contents

JXM-MUX - Technical Data

Technical Data - Electrical System: Power Supply
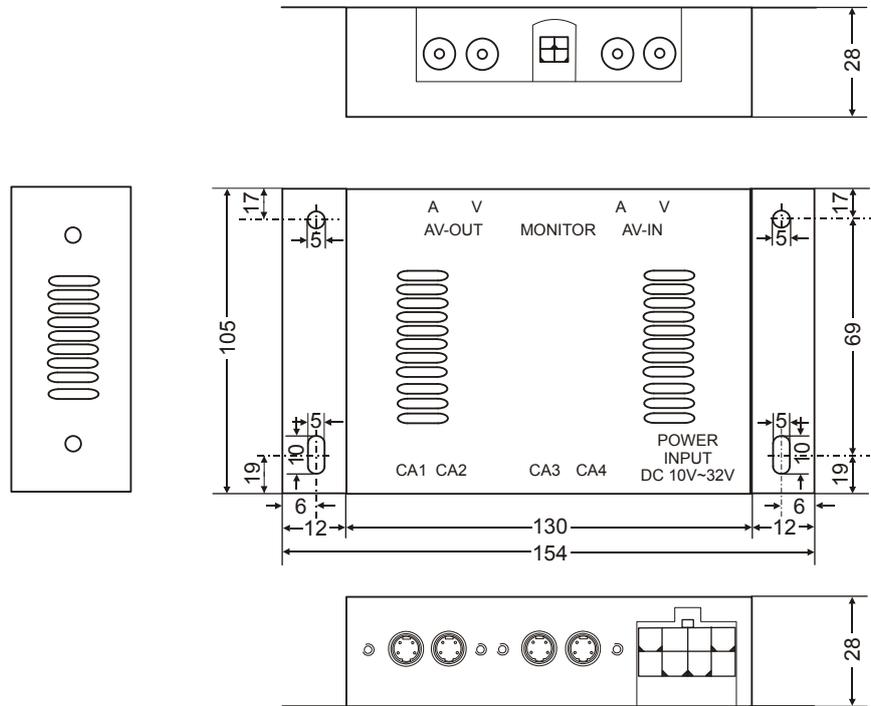
Parameter	Value
Operating voltage	10 ... 32 VDC
Typical input current at 12 VDC	2.0 A max.
Typical input current at 24 VDC	1.0 A max.
Power consumption	24 W max.

Video System

Parameter	Value
Video system	NTSC, PAL standard signal
Synchronous system	integrated
Video inputs	5 channels (4 MiniDIN, 1 RCA/cinch), composite 1 Vp-p 75 Ohm
Audio inputs	5 channels (4 MiniDIN, 1 RCA/cinch) (not supported)
Video output	1 RCA/cinch composite 1 Vp-p 75 Ohm
Audio output	1 RCA/cinch 150 mV RMS, 47 kOhm (not supported)

JXM-MUX - Physical Dimensions

Physical Dimensions

Mounting Position	The video splitter JXM-MUX can be installed in vertical or horizontal position.

JXM-MUX - Environment and Mechanics

Environment

Parameter	Value	Standard
Operating Temperature Range	-10 ... +60 °C	
Storage Temperature Range	-25 ... +80 °C	

Mechanical Parameters

Parameter	Value	Standard
Vibrations	3 G	
Degree of Protection	IP 20	DIN EN 60529
Place of Installation	Only indoors	
Mounting Position	Vertical or horizontal	
Enclosure	Steel	
Weight	approx. 0.5 kg	

B: Index

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